WHAT IS CLAIMED IS:

1. A light emitting diode (LED) comprising:

a buffer layer made of a GaN-based compound semiconductor, being grown on a substrate;

an LED structural layer formed on the buffer layer, the LED structural layer further comprising an n-type GaN layer, a multiple-quantum-well structural layer, a p-type GaAlN layer, and a p-type GaN layer, in which the n-type GaN layer is made of a GaN-based compound semiconductor and formed on the buffer layer, the multiple-quantum-well structural layer being made of an InGaN serial compound and situated on the n-type GaN layer, the p-type GaAlN layer being made of a p-type GaAlN-based compound semiconductor and grown on the multiple-quantum-well structural layer, the p-type GaN layer being made of a p-type GaN-based III-V compound semiconductor and grown on the p-type GaAlN layer;

a p-type quantum-dot epitaxial layer made of a InAlN compound, being grown on the p-type GaN layer of the LED structural layer, and part of the n-type GaN layer, the multiple-quantum-well structural layer, the p-type GaAlN layer, the p-type GaN layer, and the p-type quantum-dot epitaxial layer being removed by a single etching process;

a p-type ohmic contact electrode made of Ni/AuBe material being formed on the p-type quantum-dot epitaxial layer and electrically connected therewith; and

an n-type ohmic contact electrode being grown on the n-type GaN layer of the LED structural layer and electrically connected therewith;

whereby a forward bias can be applied to the LED.

2. A manufacture method for light-emitting diode (LED), comprising:

disposing a substrate;

growing a buffer layer on the substrate;

growing an LED structural layer on the buffer layer, in which the LED structural layer comprises an n-type GaN layer, a multiple-quantum-well structural layer, a p-type GaAlN layer, and a p-type GaN layer; and

growing a p-type quantum-dot epitaxial layer on the p-type GaN layer of the LED structural layer;

wherein the p-type quantum-dot epitaxial layer is made of Ni/AuBe material and electrically connected with a p-type ohmic contact electrode, and the n-type GaN layer made of Ti/Pt/Al/Ti/Au material is electrically connected with an n-type ohmic contact electrode so that a forward bias is applied thereto.

3. The method according to Claim 2, wherein the p-type quantum-dot epitaxial layer is a thin film of $Al_xGa_{(1-x-y)}In_yN$, where $0 \leqq x, y < 1, 0 \leqq x+y < 1$.

4. The method according to Claim 2, wherein the substrate is made any of sapphire, SiC, Si, GaAs, $LiAlO_2$, $LiGaO_2$, and AlN.

5. The method according to Claim 2, wherein the thickness of the p-type quantum-dot epitaxial layer is greater than 10Å.

6. The method according to Claim 2, wherein an average coarseness of the p-type quantum-dot epitaxial layer is greater than 10Å.